Method of Test for
DETERMIING THE EFFECT OF MOISTURE ON ASPHALTIC CONCRETE PAVING MIXTURES
DOTD Designation: TR 322M/322-03

I. Scope

A. This method of test is designed to prepare and test asphaltic concrete specimens to measure the effect of moisture on the tensile strength of the mixture. The potential for moisture damage is indicated by the tensile strength ratio (TSR), expressed as a percent of the tensile strength of a moisture-conditioned set of specimens to that of a control set of specimens. This method of test is used to evaluate lab or plant-produced mixtures to determine conformance with specification requirements during Job Mix Formula (JMF) design, validation and production. When used for the purpose of JMF validation or production, this test shall be run on specimens made from plant-produced mix.

B. Referenced Procedures:
   1. DOTD TR 304, Determination of Specific Gravity and Density Characteristics of Compressed Asphaltic Mixtures.
   2. DOTD TR 305, Stability and Flow of Asphaltic Concrete Mixtures – Marshall Method.
   3. DOTD S 203, Asphaltic Mixtures
   4. ASTM D 4123, Indirect Tension Test for Resilient Modulus of Bituminous Mixtures.
   5. DOTD TR 327, Theoretical Maximum Specific Gravity of Asphaltic Concrete Mixtures.

II. Apparatus

A. **Vacuum pump** – with gauge.

B. **Vacuum chamber** – any vessel capable of holding the specimens under vacuum. A spacer should be included to hold the specimen above the bottom of the container.

C. **Water baths** – one capable of maintaining a temperature of 60 ± 0.5°C (140 ± 1°F), and one capable of maintaining a temperature of 25 ± 0.5°C (77 ± 1°F).

D. **Freezer** – a manual-defrosting chest type freezer capable of maintaining a temperature of -18 ± 5°C (0 ± 9°F).

E. **Caliper** – capable of measuring the specimens to the nearest 0.01 mm (0.001 in.).

F. **Loading jack and proving ring assembly** – conforming to DOTD TR 305.

G. **Splitting tensile test mold** – conforming to ASTM D 4123 (Figure 1).

H. **Specimen ejector** – a hydraulic jack and stand, for removing specimens from the mold with a minimum of disturbance.

I. **Plastic Film** – "Saran Wrap" or equivalent.

J. **Plastic bags** – leak-proof and sealable.

K. **Miscellaneous equipment** – goggles, apron, gloves, marking crayons.

L. **Sample containers** – several, five-gallon, metal sample containers with lids.

M. **Scoop** – suitable for obtaining sample.

N. **Report form** (Figure 3 – English / Figure 5 – Metric)

O. **Worksheet** - DOTD Form No. 03-22-0732 (Figure 4 – English / Figure 6 – Metric).

Figure 1
Splitting Tensile Test Method

III. Safety Precautions

Caution is to be exercised when sampling, preparing, and testing asphaltic concrete specimens due to the high temperature of the mix.

IV. Samples and Test Specimens

A. **Sampling mixtures at the hot mix plant** – obtain samples in several metal sampling containers with lids in accordance with DOTD S 203.
B. **Lab prepared samples** – For mix design purposes, the mix will be prepared as specified in DOTD TR 303, Method B, for Marshall design or AASHTO PP28, for Superpave design.
C. Make at least six specimens [101.6 mm (4 in.) in diameter, approximately 63.6 mm (2.5 in.) thick for Marshall specimens or 152.4 mm (6 in.) in diameter, approximately 100 mm (4 in.) thick for gyratory specimens] for each test in accordance with DOTD TR 305 or AASHTO TP4 respectively, except that the samples are not aged and the number of blows of the hammer, gyrations of gyratory compactor or weight of mix placed in the mold must be adjusted to yield a percent air voids of 7 ± 1.0%. Determine the exact number of blows, gyrations or weight by trial and error or by developing a percent air voids vs. number of blows/gyrations/weight curve for each mixture. Record the number of blows, gyrations or weight of mix used on the worksheet. Three of these specimens will be tested dry as the control group and three will be tested after moisture conditioning.

Note 1: *Additional specimens may be needed, because specimens will be discarded if the percent air voids level or the percent saturation after vacuum, do not meet the requirements of this procedure.*

D. After the specimens have been compacted, cool each specimen in the mold to approximately room temperature. Extract the specimen from the mold using the specimen ejector, then mark each specimen with a sample ID number and record the ID number on the worksheet.

V. Procedure

A. Determine the maximum specific gravity of the mixture (G_{mm}) in accordance with DOTD TR 327. Report to the nearest 0.001 and record on the worksheet as **E**.
B. Determine the weight in air (dry), the weight in water and the weight in air (SSD) of each specimen in accordance DOTD TR 304.
   1. Record to the nearest 0.1, the weight in air (dry), the weight in water and the weight in air (SSD) as **A**, **B**, **C**, respectively, on the worksheet.
   2. Determine the volume of each specimen in accordance with Step VI.A and record as **v**.
   3. Determine the bulk specific gravity of each specimen in accordance with Step VI.B, and record as **D** on the worksheet to the nearest 0.001.
C. Calculate the percent maximum theoretical gravity, % G_{mm}, and percent air voids of each specimen in accordance with DOTD TR 304 to the nearest 0.1 and record on the worksheet as **F** and **H**. If the percent air voids is not between 7 ± 1.0%, discard the specimen.

Note 2: *One additional specimen is required for each specimen discarded.*

D. Sort the specimens into two sets of three so that the average percent air voids of the two sets are as close to equal as possible. One set will be used for control and the other for moisture-conditioning. Record the average percent air voids for each set on the worksheet.
E. Mark each specimen in the control set with a C and each specimen in the moisture-conditioned set with an M. Record the C and M as part of the

sample ID on the worksheet. Store the control set at room temperature.

Note 3: *The average tensile strength of the control set may be determined in accordance with Step V.P. – V. after a minimum storage time of two hours at room temperature.*

F. Completely submerge the specimens to be moisture-conditioned in the vacuum chamber in potable water at room temperature. Cover with a minimum of 25mm (1 in.) of water before vacuum is applied.

G. Apply a partial vacuum in order to partially saturate the set to a minimum of 55% and a maximum of 80%. Record the inches of Hg and the time of saturation on the worksheet.

Note 4: *A partial vacuum of approximately 500 mm (20 in.) Hg for five minutes may be used as a guideline. These parameters may need to be adjusted as necessary to obtain the correct saturation.*

H. Remove the vacuum and leave the specimen submerged in water for 5 to 10 minutes.

I. Remove the saturated specimens from the vacuum chamber and determine the weight in water and the weight in air (SSD), in accordance with DOTD TR 304, to the nearest 0.1 g. Record on the worksheet as **I** and **G**, respectively.

J. Calculate the volume (**V**), volume of absorbed water (**W**), volume of the air voids (**V**$_v$), and percent saturation (**N**) of the saturated specimens, after vacuum conditioning, in accordance with Steps VI.C. – E.

K. When the percent saturation of any conditioned specimen is between 55% and 80%, proceed to Step L. When the percent saturation is less than 55%, repeat the vacuum procedure beginning with Step F, using a slightly higher vacuum or a longer period of time. When the percent saturation is more than 80%, the specimen has been damaged and must be replaced with another conditioned specimen, repeating the vacuum procedure beginning with Step F.

L. Immediately wrap each moisture-conditioned specimen tightly with plastic film and place them into a leak-proof plastic bag containing approximately 10 mL of potable water. Seal the bag to prevent leakage. Place each specimen in the freezer for a minimum of 16 hours at -18 ± 3°C (0 ± 5°F).

M. Remove each moisture-conditioned specimen from the freezer and immerse the bag with specimen in a water bath containing potable water at 60 ± 1°C (140 ± 2°F). While in the water bath, remove the plastic bag and plastic film after approximately 3 minutes of immersion or after surface thaw occurs.

N. Remove the moisture-conditioned specimens from the 60°C (140°F) bath after 24 ± 1 hours and immediately place the specimens in a 25 ± 0.5°C (77 ± 1°F) water bath containing potable water 2 ± 1 hours.

O. Remove the moisture-conditioned specimens from the water bath.

P. Measure the thickness of each specimen, moisture-conditioned or control, to the nearest 0.1 mm (0.001 in.) at three locations spaced approximately equally around the circumference and record on the worksheet at **T**$_1$, **T**$_2$, and **T**$_3$.

Q. Measure the diameter of each specimen to the nearest 0.1 mm (0.001 in.) along perpendicular planes on opposite ends of the specimen. Record on the worksheet as **D**$_1$ and **D**$_2$.

R. Calculate the average of each set of measurements and record on the worksheet as **T** and **D**.

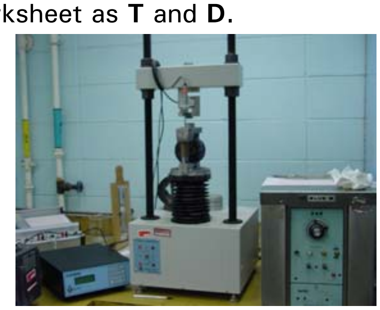

Figure 2
Splitting Tensile Test Mold with Specimen

S. Place all six specimens in a 25 ± 0.5°C (77 ± 1°F) water bath for 20 – 30 minutes.
T. Maintain the splitting tensile test mold at room temperature.
U. Determine the tensile strength of each specimen at 25°C (77°F) by placing it into the splitting tensile test mold and positioning it so that it is vertically centered on the loading strips and butted against the rear guide adjacent to the large post (Figure 2). Apply a load at 50.8 mm/min (2 in/min) until a maximum dial reading is reached. Record the dial reading on the worksheet. Determine and record the maximum load on the worksheet as **P**.

Note 5: *Specimens may be completely broken for visual observation of stripping, moisture damage, or broken or cracked aggregate. Record observations on the worksheet in "Remarks."*

VI. Calculations

A. Calculate the volume (**v**) of each moisture-conditioned specimen to the nearest 0.1 g using the following formula:

$$v = C - B$$

where:

C = weight in air (SSD), g
B = weight in water, g

example:

C = 3997.0
B = 2271.4

$$v = 3997.0 - 2271.4$$
$$v = 1725.6$$

B. Calculate the bulk specific gravity (**D**) of each specimen to the nearest 0.001 g using the following formula:

$$D = \frac{A}{v}$$

where:

A = weight in air (dry), g
v = Volume, cc

example:

A = 3988.4
v = 1725.6

$$D = \frac{3988.4}{1725.6}$$

$$= 2.31131$$
$$D = 2.311$$

C. Calculate the volume (**V**) of the saturated specimens, after vacuum conditioning, to the nearest 0.1 using the following formula.

$$V = G - I$$

where:

G = weight in air (SSD) (after vacuum conditioning), g
I = weight in water (after vacuum conditioning), g

example:

G = 4062.9
I = 2342.5

$$V = 4062.9 - 2342.5$$
$$V = 1720.4$$

D. Calculate the volume of absorbed water (**W**) of the saturated specimens, after vacuum conditioning, to the nearest 0.1 using the following formula:

$$W = G - A$$

where:

G = weight in air (SSD) (after vacuum conditioning), g
A = weight in air (dry), g

example:

G = 4062.9
A = 3988.4

$$W = 4062.9 - 3988.4$$
$$W = 74.5$$

E. Calculate the volume of the air voids (**V_v**) of the saturated specimens to the nearest 0.1 using the following formula:

$$V_v = \frac{H \times v}{100}$$

where:

H = % air voids (prior to vacuum conditioning), %
v = volume (prior to vacuum conditioning), cc

example:

H = 6.7
v = 1725.6

$$V_v = \frac{6.7 \times 1725.6}{100}$$
$$= \frac{11561.52}{100}$$
$$= 115.6152$$
$$V_v = 115.6$$

F. Calculate the percent saturation (**N**) of each moisture-conditioned specimen to the nearest 1% using the following formula:

$$N = \frac{100 \times W}{V_v}$$

where:

W = volume of absorbed water, cc
V_v = volume air voids, cc
100 = constant

example:

W = 74.5
V_v = 115.6

$$N = \frac{100 \times 74.5}{115.6}$$
$$= \frac{7450}{115.6}$$
$$= 64.45$$
$$N = 64$$

Note 6: *Examples of the above calculations are shown in Figure 3.*

G. Calculate the average thickness (**T**) and diameter (**D**) of each specimen to the nearest 0.1 mm (0.001 in.) using the following formulas:

$$T = \frac{T_1 + T_2 + T_3}{n}, \quad \text{and}$$

$$D = \frac{D_1 + D_2}{n}$$

where:

T_1, D_1 = individual measurements
n = no. of individual measurements

example (English):

T_1 = 3.950 D_1 = 5.935
T_2 = 3.935 D_2 = 5.914
T_3 = 3.938

n = 3, for T
n = 2, for D

$$T = \frac{3.950 + 3.935 + 3.938}{3}$$
$$= \frac{11.823}{3}$$
$$= 3.94100$$
$$T = 3.941$$

$$D = \frac{5.935 + 5.914}{2}$$

$$= \frac{11.849}{2}$$

$$D = 5.92450$$
$$D = 5.924$$

Note 7: *See Figures 4 and 6 for Metric example.*

H. Calculate the tensile strength of each specimen to the nearest 1 kPa (1 psi) using the following formulas:

English:

$$S_{tm} = \frac{2P}{\pi TD}$$

$$S_{tc} = \frac{2P}{\pi TD}$$

Metric:

$$S_{tm} = \frac{2P}{\pi TD} \times 10^6$$

$$S_{tc} = \frac{2P}{\pi TD} \times 10^6$$

where:

S_{tm} = tensile strength of moisture-conditioned specimen, kPa (psi)
S_{tc} = tensile strength of control specimen, kPa (psi)
P = maximum load, kN (lb)
T = average thickness, mm (in.)
D = average diameter, mm (in.)
2 = constant
π = 3.1416
10^6 = constant to convert mm^2 to m^2

example (English):

P = 4592 lb
T = 3.941 in.
D = 5.924 in.

$$S = \frac{2 \times 4592}{3.1416 \times 3.941 \times 5.924}$$

$$= \frac{9184}{73.3453}$$

$$= 125.22$$
$$S = 125$$

I. Calculate the average tensile strength of the moisture-conditioned specimens and the control specimens to the nearest kPa (1 psi) using the following formulas:

$$\text{Avg } S_{tm} = \frac{\sum S_{tm}}{3}$$

$$\text{Avg } S_{tc} = \frac{\sum S_{tc}}{3}$$

where:

Avg S_{tm} = average tensile strength of the moisture-conditioned set, kPa (psi)
ΣS_{tm} = total of all S_{tm}
Avg S_{tc} = average tensile strength of the control set, kPa (psi)
ΣS_{tc} = total of all S_{tc}
3 = number of specimens

examples:

$$\text{Avg } S_{tm} = \frac{125 + 135 + 130}{3}$$

$$= \frac{390}{3}$$

$$= 130.00$$
$$\text{Avg } S_{tm} = 130$$

$$\text{Avg } S_{tc} = \frac{141 + 139 + 133}{3}$$

$$= \frac{413}{3}$$

$$= 137.66$$

$$\text{Avg } S_{tc} = 138$$

J. Calculate the tensile strength ratio (TSR) to the nearest 1% using the following formula:

$$TSR = \left(\frac{\text{Avg } S_{tm}}{\text{Avg } S_{tc}}\right) \times 100$$

where:

Avg S_{tm} = average tensile strength of the moisture-conditioned set, kPa (psi)
Avg S_{tc} = average tensile strength of the control set, kPa (psi)
100 = constant

example:

Avg S_{tm} = 130
Avg S_{tc} = 138

$$TSR = \left(\frac{130}{138}\right) \times 100$$

$$= 0.9420 \times 100$$

$$= 94.20$$

$$TSR = 94$$

VII. Report

The report shall include the following information (Figures 4 and 6).

A. Job Mix Formula sequence number and mix code, number of blows/gyrations/weight, plant type, and lot number (when applicable);
B. Job Mix Formula maximum theoretical specific gravity, G_{mm};
C. Average percent air voids of each set, moisture-conditioned and control;
D. Average tensile strength of each set, moisture-conditioned and control
E. Tensile Strength Ratio, expressed as a percentage.

VIII. Normal Test Reporting Time

The normal test reporting time is 3 days.

MATT MENU SELECTION - 09

DOTD 03-22- 0732
Rev. 05/03

Louisiana Department of Transportation and Development
TENSILE STRENGTH RATIO (TSR)
(AASHTO T 283 / DOTD TR 322)

Project No. 015-05-0041 **Date Rec'd.** 4/30/03

Material Code 6 6 1 **Lab No.** 58-143739

Date Sampled 04-29-03 **Submitted By** 05931

Quantity **Units** **Purpose Code** 3

Plant Code H914 **Spec. Code** 1

P O No. **Date Tested** 05-06-03

Ident. TSR-45

Remarks 1

Remarks 2

Item No. 502

Sampled By: A. LINDER Date: 4/29/03

	TEST RESULTS	P/F
	XXXXXXXXXXXXXXX	XXX
	XXXXXXXXXXXXXXX	XXX
JOB MIX FORMULA SEQUENCE NO	0415	XXX
LOT NUMBER	4531	XXX
MIX CODE		XXX
NO. OF BLOWS PER SIDE		XXX
AVG. NO. OF GYRATIONS	0311	XXX
PLANT TYPE	3	XXX

1 = Batch Screenless 2 = Batch Hot Bin
3 = Drum Mixer 4 = Continuous

	XXXXXXXXXXXXXXX	XXX
	XXXXXXXXXXXXXXX	XXX
JMF MAX. THEORETICAL SPECIFIC GRAVITY (G_{mm})	2•477	XXX
AVG. AIR VOIDS (MOISTURE-CONDITIONED SET), %	7•3	XXX
AVG. AIR VOIDS (CONTROL SET), %	7•4	XXX
AVG. TENSILE STRENGTH (MOISTURE-CONDITIONED SET),PSI (kPa)	130	XXX
AVG. TENSILE STRENGTH (CONTROL SET), PSI (kPa)	138	XXX
TENSILE STRENGTH RATIO (TSR), %	94	P

Tested By: G. C., S. H. Date: 5/6/03

Checked By: D. S. Date: 5/6/03

APPROVED BY: D. L. ENGINEER **Date:** 5/7/03 *(OVER)*

Figure 3
Tensile Strength Ratio Report Form – English

TENSILE STRENGTH RATIO (TSR) --(AASHTO T 283 / DOTD TR 322)

Project No.: 015-05-0041 Date Sampled: 04-29-03 Date Tested: 05-06-03

E. Max. Theo. Gr:(G_{mm}) 2.477 Sample Set ID: TSR-045 JMF Seq.No: 045 Mix Type: ______

	SAMPLE ID		1-M	2-M	3-M	4-C	5-C	6-C		
A	Wt. (Mass) in Air - (Dry),g	From TR 304	3988.4	3974.1	3958.0	3973.0	3976.4	3966.8		
B	Wt. (Mass) in Water,g	From TR 304	2271.4	2254.6	2240.2	2254.0	2248.2	2247.9		
C	SSD Wt. (Mass),g	From TR 304	3997.0	3991.4	3969.8	3985.0	3981.8	3979.2		
v	Volume,cc	(C - B)	1725.6	1736.8	1729.6	1731.0	1733.6	1731.3		
D	Bulk Sp Grav G_{mb} (TR 304)	(A / v)	2.311	2.288	2.288	2.295	2.294	2.291		
F	% Gmm (TR 304)	(D / E x 100)	93.3	92.4	92.4	92.7	92.6	92.5		
H	% Air Voids	(100 - F)	6.7	7.6	7.6	7.3	7.4	7.5		

Avg %Voids (Cond) = 7.3 Avg % Voids (Ctrl) = 7.4 Hg = 30 in. Time (sec) = 10 sec # Blows/Gyrations = 31 Weight, g = 3970

AFTER VACUUM CONDITIONING								
G	Weight in Air (SSD), g		4062.9	4061.2	4045.7			
I	Weight in Water, g		2342.5	2333.9	2323.2			
V	Volume, cc	(G-I)	1720.4	1727.3	1722.5			
W	Vol. Abs. Water,cc	(G-A)	74.5	87.1	87.7			
V_V	Vol. Air Voids, cc	(H x V)/100	115.6	132.0	131.4			
N	% Saturation	(100W/V_v)	64	66	67			

INDIRECT TENSILE TESTING									
Specimen Thickness (in or mm) circle unit used	T_1	3.950	3.945	3.936	3.954	3.946	3.951		
	T_2	3.935	3.956	3.939	3.940	3.953	3.951		
	T_3	3.938	3.954	3.946	3.956	3.960	3.946		
	T	3.941	3.952	3.940	3.950	3.953	3.949		
Specimen Diameter (in or mm) circle unit used	D_1	5.935	5.918	5.917	5.904	5.904	5.944		
	D_2	5.914	5.928	5.925	5.934	5.916	5.914		
	D	5.924	5.923	5.921	5.919	5.910	5.929		
Dial Reading (Ring # 2265)		332	359	344	374	369	354		
P	Maximum Load (From Chart) (lb or kN)	4592	4962	4757	5168	5100	4893		
S	Strength (psi or kPa)	125	135	130	141	139	133		
Strength (Control)					141	139	133		
Strength (Conditioned)		125	135	130					

Avg. Tensile Strength (Ctrl.) (psi or kPa)	138
Avg. Tensile Strength (Cond.) (psi or kPa)	130
TSR ($\frac{\text{Avg Cond}}{\text{Avg Cont}}$) x100, %	94

Tested By: G.C. S.H. Date: 5/6/03

Checked By: D.S. Date: 5/6/03

Remarks: ______

Approved By: D.L. ENGINEER **Date:** 5/7/03

Figure 4
Tensile Strength Ratio (TSR) of Asphaltic Concrete Worksheet – English

MATT MENU SELECTION - 09

DOTD 03-22- 0732
Rev. 05/03

Louisiana Department of Transportation and Development
TENSILE STRENGTH RATIO (TSR)
(AASHTO T 283 / DOTD TR 322)

Project No. 011-05-0041
Date Rec'd. 4/30/03
Material Code 661
Lab No. 58-1143739
Date Sampled __-__-__
Submitted By 05913
Quantity ___ **Units** ___
Purpose Code 3
Plant Code H9114
Spec. Code 1
P O No. ___
Date Tested 05-06-03
Ident. ___
Remarks 1 ___
Remarks 2 ___
Item No. 502
Sampled By: A. Linder
Date: 4/29/03

	TEST RESULTS	P/F
	XXXXXXXXXXXXXXX	XXX
	XXXXXXXXXXXXXXX	XXX
JOB MIX FORMULA SEQUENCE NO	045	XXX
LOT NUMBER	4531	XXX
MIX CODE		XXX
NO. OF BLOWS PER SIDE		XXX
AVG. NO. OF GYRATIONS	0311	XXX
PLANT TYPE	3	XXX

1 = Batch Screenless 2 = Batch Hot Bin
3 = Drum Mixer 4 = Continuous

	TEST RESULTS	P/F
	XXXXXXXXXXXXXXX	XXX
	XXXXXXXXXXXXXXX	XXX
JMF MAX. THEORETICAL SPECIFIC GRAVITY (G_{mm})	2.477	XXX
AVG. AIR VOIDS (MOISTURE-CONDITIONED SET), %	7.3	XXX
AVG. AIR VOIDS (CONTROL SET), %	7.4	XXX
AVG. TENSILE STRENGTH (MOISTURE-CONDITIONED SET),PSI (kPa)	896	XXX
AVG. TENSILE STRENGTH (CONTROL SET), PSI (kPa)	949	XXX
TENSILE STRENGTH RATIO (TSR), %	94	P

Tested By: G. C., S.W. Date: 5/6/03

Checked By: D. S. Date: 5/6/03

APPROVED BY: D.L. ENGINEER **Date:** 5/7/03

(OVER)

Figure 5
Tensile Strength Ratio (TSR) Report Form – Metric

TENSILE STRENGTH RATIO (TSR) --(AASHTO T 283 / DOTD TR 322)

Project No.: 015-05-0041 Date Sampled: 4-29-03 Date Tested: 5-6-03

E. Max. Theo. Gr:(G_{mm}) 2.477 Sample Set ID: TSR-045 JMF Seq.No: 045 Mix Type: ________

	SAMPLE ID									
A	Wt. (Mass) in Air - (Dry),g	From TR 304								
B	Wt. (Mass) in Water,g	From TR 304								
C	SSD Wt. (Mass),g	From TR 304								
v	Volume,cc	(C - B)								
D	Bulk Sp Grav G_{mb} (TR 304)	(A / v)								
F	% Gmm (TR 304)	(D / E x 100)								
H	% Air Voids	(100 - F)								

Avg %Voids (Cond) = ______ Avg % Voids (Ctrl) = ______ Hg = ______ Time (sec) = ______ Weight, g = ______ # Blows/Gyrations = ______

	AFTER VACUUM CONDITIONING									
G	Weight in Air (SSD), g									
I	Weight in Water, g									
V	Volume, cc	(G-I)								
W	Vol. Abs. Water,cc	(G-A)								
V_V	Vol. Air Voids, cc	(H x V)/100								
N	% Saturation	($100W/V_v$)								

INDIRECT TENSILE TESTING										
Specimen Thickness (in. or mm) circle unit used	T_1	100.3	100.2	100.0	100.4	100.2	100.4		
	T_2	99.9	100.5	100.1	100.1	100.4	100.4		
	T_3	100.0	100.4	100.2	100.5	100.6	100.2		
	T	100.1	100.4	100.1	100.3	100.4	100.3		
Specimen Diameter (in. or mm) circle unit used	D_1	150.7	150.3	150.3	150.0	150.0	151.0		
	D_2	150.2	150.6	150.5	150.7	150.3	150.2		
	D	150.5	150.4	150.4	150.4	150.2	150.6		
	Dial Reading (Ring # 2265)	332	359	344	374	369	354		
P	Maximum Load (From Chart) (lb or kN)	20.43	22.07	21.16	22.99	22.69	21.78		
S	Strength, psi or kPa	863	930	895	970	958	918		
	Strength (Control)	X	X	X	970	958	918		
	Strength (Conditioned)	863	930	895	X	X	X		
	Avg. Tensile Strength (Ctrl.) (psi or kPa)	949							
	Avg. Tensile Strength (Cond.) (psi or kPa)	896							
	TSR ($\frac{\text{Avg Cond}}{\text{Avg Cont}}$) x100, %	94							

Tested By: G. C., S. H. Date: 5/6/03

Checked By: D. S. Date: 5/6/03

Remarks: ____

Approved By: D.L. ENGINEER **Date:** 5/7/03

Figure 6
Tensile Strength Ratio (TSR) of Asphaltic Concrete Worksheet – Metric